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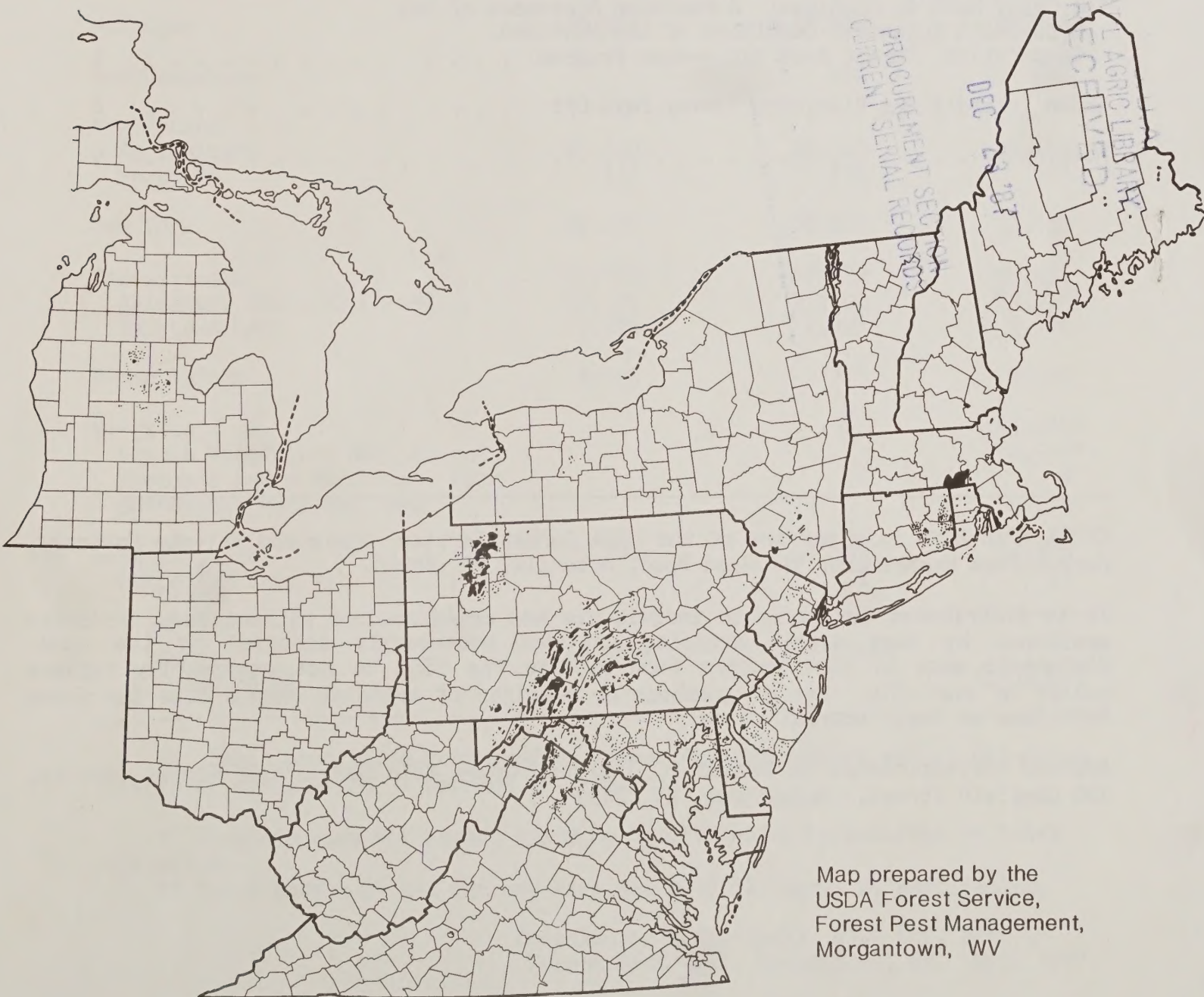
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Number 15

GYPSY MOTH NEWS

370 REED ROAD, BROOMALL, PA 19008
U.S.D.A., FOREST SERVICE

GYPSY MOTH DEFOLIATED AREAS IN THE USA - 1987



Map prepared by the
USDA Forest Service,
Forest Pest Management,
Morgantown, WV

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GYPSY MOTH DEFOLIATION ACREAGES - 1987 1/

State/Site	Moderate 31-60%	Heavy 61-100%	Total
Connecticut	34,944	30,420	65,364
Delaware	997	1,533	2,530
District of Columbia	12		12
Maine	499	149	648
Maryland	17,348	59,344	76,692
Catocin Mountain Park	24	24	48
Harper's Ferry Nat. Hist. Park		63	63
Massachusetts	22,068	6,671	28,739
Michigan	26,381	13,062	39,443
New Hampshire		290	290
New Jersey			
Agriculture	28,180	66,320	94,500
Forestry	111	493	604
New York	28,275	26,875	55,150
Pennsylvania	440,459	354,972	795,431
Allegheny National Forest	52,120	22,800	74,920
Raystown Lake	7,789	2,195	9,984
Rhode Island	4,775	275	5,050
Virginia			51,528*
George Washington Nat. Forest			6,555*
Harper's Ferry Nat. Hist. Park		2	2
Shenandoah National Park			9,610*
West Virginia	5,300	7,179	12,479
Harper's Ferry Nat. Hist. Park		11	11
Total	669,282**	592,678**	
Grand Total			1,329,653

1/ Based upon State-conducted or Forest Pest Management aerial detection surveys of defoliation 31 percent or greater.

* Virginia does not report gypsy moth defoliation by moderate or heavy categories.

** These totals do not include Virginia's 67,693 acres of defoliation.

Compiled by H. Machesky, USDA For. Serv.,
Forest Pest Mgt., Morgantown, WV. Oct. 1987.

APPALACHIAN GYPSY MOTH IPM DEMONSTRATION PROJECT

A 1987 Supplemental Appropriations Bill from the U.S. Congress directed the Forest Service to develop an integrated pest management project aimed at slowing the spread of the gypsy moth down the Allegheny Mountains and including intensification of survey, data collection and suppression of low level gypsy moth populations. This direction resulted from questions raised by Senator Robert C. Byrd of West Virginia during the 1987 Supplemental Appropriation Hearings about the current status and trend of the gypsy moth in the Allegheny Mountains. The Appalachian Gypsy Moth IPM Demonstration Project (AIPM) was developed in response.

The Project is designed to apply all existing gypsy moth knowledge and technology in the mountains of West Virginia and Virginia. The area includes the Monongahela, George Washington and Jefferson National Forests and the Shenandoah National Park in addition to State and private lands in the two States. The goal of the Project is to employ an integrated pest management approach to minimize adverse effects and the spread of the pest through the area.

Richard Reardon (USDA Forest Service, Morgantown, WV) has been named Project Leader and will be supported by two Project Coordinators, one in West Virginia and one in Virginia. Dick is responsible for directing all phases of the Project while the Project Coordinators will be responsible for overseeing implementation in their respective States. A Steering Committee will review overall project direction and a Planning Committee made up of all major cooperators in the Project will develop the actual implementation plan.

Implementation plans, including the design of a monitoring network and data collection protocols as well as the development of a decision matrix that will be used to guide specific information activities are being developed. Data collection and actual application of intervention activities will be conducted by the States and Federal cooperators. Data collection will begin shortly and some management actions will take place in 1988.

For more information contact Dr. Richard Reardon, USDA Forest Service, 180 Canfield Street, Morgantown, WV, 26505.

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GYPSY MOTH SUPPRESSION PROGRAM INITIATED BY THE DISTRICT OF COLUMBIA

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The City of Washington, DC, jumped into gypsy moth control programs in a big way this past summer by aurally treating about 2,000 acres in the northwest section of the city. This was not the first time the city's Department of Public Works (DPW) attempted control of the insect. In 1986 DPW sprayed trees along selected oak-lined boulevards in the same area using truck-mounted equipment. The project this year, however, represents the first large-scale aerial application ever mounted by the City.

The treatment involved the aerial application of Bt (Dipel 8AF) at the rate of 12 BIUs in 0.75 gallons of total mix per acre to about 2,000 acres on May 1. One week later (May 8) a second application of Bt at the same rate was applied to about 1000 acres in the northern half of the spray block. The project also included two applications of the gypsy moth NPV product GYPCHEK to 18 acres in the Pinehurst area of Rock Creek Park on the same dates. The GYPCHEK was applied at the rate of 1×10^{12} PIBs (Polyinclusion bodies) in 1.5 gallons of total mix per acre. The formulation also included an ultraviolet sunscreen called ORZAN.

The effort required the coordination and cooperation among three city and two Federal agencies. Besides DPW, the city agencies involved were the DC Cooperative Extension Service (CES), and the DC Department of Consumer and Regulatory Affairs (DCRA). The CES provided the monitoring data upon which the city selected the treatment area, and collected pre-treatment and post-treatment data in the treatment area. The DCRA monitored the program to see that DC pesticide laws and regulations were followed throughout project planning and implementation. The USDI National Park Service (Rock Creek Park) handled all of the ground support required for treating the Pinehurst Section of Rock Creek Park, and for mixing and loading the GYPCHEK. They also conducted intensive pre- and post-treatment monitoring of the insect populations and evaluated GYPCHEK deposition in the target area. The USDA Forest Service (Forest Pest Management) provided overall technical support on the project, which included, but was not limited to, reviewing the contract, aircraft calibration and characterization, weather monitoring during the project, spray deposit monitoring, defoliation surveys, and coordination of post-treatment evaluations.

There were no operational difficulties encountered, and except for a very light shower prior to the second application of Bt and GYPCHEK, the weather was perfect. Insect larval development was estimated to be about 80 percent first instar and 20 percent second instar at the time of the first application and about 40 percent first instar and 60 percent second instar with several third instar caterpillars observed during the second application. Oak tree foliage was between 25 and 50 percent expanded during the first application and greater than 50 percent expanded during the second application. Egg hatch was completed before the project commenced.

Both applications of Bt and GYPCHEK were applied using a large Bell 212 helicopter provided by AgRotors, Inc. of Gettysburg, PA. The delineation of a single large spray block rather than a series of smaller ones over the same area favored the use of a large aircraft. The pilot was able to fly the ship the entire length of the treatment area (about 3 miles) turning the spray booms on when trees were encountered and turning it off over open areas. This made for a very time efficient project; a definite advantage in highly urbanized situations where suppression projects must contend with the presence of school buses, commuters, school children and other pedestrian traffic in the treatment area. The average production time of the Bell 212 for the two applications of Bt was about 1,000 acres per hour.

Post-treatment insect population and damage data were collected in the treatment area. These data are in the process of being analyzed. In general, it was observed that both larval and egg mass counts were lower in the spray blocks compared to the adjacent untreated areas. The Bt and GYPCHEK applications did prevent noticeable defoliation from occurring

in the spray block. This was determined from aerial sketchmapping conducted in cooperation with the National Park Service and from interpretation of high altitude color infrared photography.

The conduct of a large scale aerial suppression project this past summer and the subsequent presence of gypsy moth cause defoliation elsewhere in the District of Columbia underscores the need to continue the multi-agency cooperation and coordination that characterized the 1987 gypsy moth program. As a result, a gypsy moth monitoring group was established to review and attempt to coordinate the insect monitoring activities conducted by the National Park Service and Forest Service on Federal lands, and the DC Cooperative Extension Service and Department of Public Works on city-owner and private property. The first accomplishment of this association has been the development of a city-wide gypsy moth monitoring plan. The working group will also look for opportunities to cooperate with the adjacent jurisdictions in Maryland and Virginia to manage gypsy moth in areas of mutual concern.

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GYPSY MOTH IN ONTARIO

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The gypsy moth (Lymantria dispar) (Linn.) was first detected in 1969 on Wolfe Island near the city of Kingston at the east end of Lake Ontario. From 1969 to 1980 gypsy moth populations remained relatively low in southern Ontario. However, in 1981, some 23 pockets of gypsy moth defoliation totalling 1,450 ha were detected. The largest of these pockets of defoliation were located near Kaladar, about 70 km northwest of Kingston. Since then, infestations expanded each year till 1985 when 246,342 ha of defoliation was mapped. In 1986, the extent of infestation dropped to 167,776 ha and in 1987 declined even more dramatically to only 12,678 ha. Natural factors including virus, parasites, predators and overwintering survival of egg-masses are considered responsible for the decline.

The gypsy moth situation in Ontario with respect to forestry concerns is monitored by the Forest Insect and Disease Survey Unit, Canadian Forestry Service, Great Lakes Forestry Centre, Sault Ste. Marie. Monitoring methods include aerial and ground observation (detection and mapping of defoliation), egg-mass surveys, pheromone trapping, burlap trapping and semi-permanent plots to assess impact (damage and tree mortality). Most of this work is done on a cooperative basis with the Ontario Ministry of Natural Resources (OMNR). The FIDS group is also responsible for the assessment of aerial spraying program conducted by OMNR.

In 1982 OMNR planned to spray about 2000 ha near Kaladar to suppress populations of the insect. The

proposed operation was opposed by a few local citizens due to the intended use of the chemical insecticide Sevin (carbaryl). A small experiemntal program totalling 416 ha, employing B.t., virus and Sevin was conducted by the Canadian Forestry Service after OMNR cancelled the proposed operation.

There was no spraying by OMNR in 1983 or 1984. In 1985, 170 ha consisting of parts of three provincial parks in the Eastern Region were aerially treated with B.t. In the face of a large spread of gypsy moth in the summer of 1985 that generated considerable public concern and media attention, OMNR decided to conduct extensive suppression operations the following year. In 1986, OMNR aerially sprayed a total of some 103,100 ha of forest in the Eastern Region with multiple applications of B.t. This program is the largest to date conducted against gypsy moth in Canada. In 1987, a total of 40,250 ha were treated with B.t. Generally, the results of these large scale programs have been good in terms of foliage protection although quite variable.

Table 1. Gross area of moderate-to-severe defoliation by gypsy moth in Ontario 1981-87 and area sprayed.

Year	Gross area (ha) of moderate- to-severe defoliation	Area (ha) Sprayed
1981	1,450	
1982	4,800	416 (a)
1983	40,954	
1984	80,624	
1985	246,342	170 (b)
1986	167,776	103,100 (b)
1987	12,678	40,250 (b)

(a) experimental - virus, B.t., and Sevin

(b) operational - B.t.

RESEARCH AT THE GREAT LAKES FORESTRY CENTRE, ONTARIO

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Research on the gypsy moth commenced soon after the pest was first found in Ontario in 1969. Early work was concerned with the potential for dispersal in Ontario and included cold hardiness studies of gypsy moth eggs and of the two introduced egg parasitoids Anastatus disparis and Ooencyrtus kuvanae. A review of world literature on natural control factors was prepared and a general bibliography containing about 4000 entries was compiled. Surveys of the parasitoid complex of the gypsy moth were done in 1974/75 and 1979/80. On the basis of these surveys, the egg parasitoid O. kuvanae was introduced in 1976 and the second egg parasitoid was released at a total of 9 locations in 1980, 1982, and 1983. Both species have become established. A small release of the tachinid larval parasitoid Parasetigena silvestris from an alpine source in Europe was made in 1984. This latter parasitoid and all other exotic species which have become common in the eastern United State are present in Canada as well. Cooperative work with the Commonwealth Institute of Biological Control (CAB International) in low level populations as a source for potential biological control agents for introduction into Canada. Prior to that time most investigation had taken place in outbreak populations. A promising tachinid species, Ceranthia samarensis has been imported into Canada for research in 1984, 1985, and 1986, while studies in Europe are continuing. In 1986 and 1987 the research program on gypsy moth was expanded in the field and laboratory, particularly relating to

the natural control factors and the relationships among the pest and its parasitoids with weather and climate. The search for potential biological control agents is being widened.

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THE GYPSY MOTH TECHNICAL COMMITTEE: A COOPERATIVE EFFORT

In the mid 1970's forest entomologists from Michigan's universities, the Michigan Department of Natural Resources, and the USDA Forest Service formed the Michigan Cooperative Forest Pest Management Program. The goals were to devise new technologies, transfer available technology, and provide service and management alternatives to forest land managers. The Program now includes representatives from other agencies and institutions and is considered an exemplary model of cooperation in education, research and development.

For the first time in the Program's existence, members formed a sub-group to address a specific forest pest management problem, the gypsy moth. Due to the gypsy moth's extreme importance and visibility in the State, program members recognized the need to concentrate on this forest insect. Informal meetings were held on the gypsy moth throughout the early 1980's to coordinate efforts primarily aimed at monitoring and detection programs. On October 23, 1986, members of the Michigan Cooperative Forest Pest Management Program formed the Gypsy Moth Technical Committee for Michigan.

THE GYPSY MOTH IN MICHIGAN: A POSITION STATEMENT OF THE GYPSY MOTH TECHNICAL COMMITTEE OF THE MICHIGAN COOPERATIVE FOREST PEST MANAGEMENT PROGRAM

We the members of the Michigan Cooperative Forest Pest Management Program, having concern for the gypsy moth situation in this State for the past several years, advocate the following position concerning the management of the gypsy moth in Michigan: A State-sponsored public education, research, regulation and suppression program for the gypsy moth is a top priority for the immediate future. Program development and decision-making based on multi-year projections of gypsy moth trends is critical in guaranteeing the success of such a program.

This position is based on a number of biological, ecological, and economical principles about the gypsy moth, including: 1) the gypsy moth can not be eliminated from Michigan; 2) repeated defoliation of healthy trees can lead to tree mortality; 3) use of insecticides to control gypsy moth is cost-effective only for the purpose of holding timber for improved markets or for nuisance relief and for protecting high value shade and landscape trees; and 4) large scale use of insecticides can negatively affect a number of natural control mechanisms which are active throughout a gypsy moth cycle. These tenets are elaborated in the following paragraphs.

Gypsy Moth: A Permanent Resident

Elimination of the gypsy moth from Michigan is not feasible; the insect is now a permanent resident of our State's forests. Brought from Eurasia, it has established itself as an integral part of the hardwood forest types throughout the northeastern United States and

Canada. It joins a long list of exotic and indigenous insects currently part of the Michigan forest pest complex, some of which are indicated in the following list:

Native

Jack pine budworm
Spruce budworm
Eastern tent caterpillar
Forest tent caterpillar
Redhumped oakworm

Exotic

European pine shoot moth
Introduced pine sawfly
European pine sawfly
European elm bark beetle
Elm leaf beetle

Attempts to eradicate small, isolated infestations as the insect is carried into Michigan's Upper Peninsula may slow the spread of the insect; elimination of the insect from our State is neither biologically feasible nor economically justifiable. As with these other pests, emphasis should be on managing forests and trees to withstand outbreaks of the gypsy moth, rather than attempting to control or eradicate the pest.

Gypsy Moth and People

Gypsy moth affects the homeowner/recreationist and the forest landowner. To the homeowner and recreationist, gypsy moth is a nuisance, an aesthetic problem, and a potential threat to their trees. During years when it is not at outbreak levels, the insect is likely to escape detection by people. During the two or three years of a cycle when populations of the moth can be high, larvae may cling to exterior walls of homes, spoil outdoor activities, denude trees, cause some tree

mortality, and occasionally cause allergic reactions. Successive heavy defoliation can predispose trees to die. Trees stressed by lack of water or poor site conditions are more susceptible to damage than are healthy trees. Tree care measures such as spring and fall fertilization, frequent watering during dry spells, and avoidance of mechanical damage and soil compaction can be effective in minimizing problems associated with gypsy moth feeding. An important consideration here is that hardwood trees, which are the preferred hosts, usually can sustain two to three years of complete defoliation before showing any long-term effects. Use of insecticides to save foliage during outbreak periods is effective but expensive. A spray program can provide temporary relief from gypsy moth infestations, but alone it is not a long-term solution. Other management options should be considered by the homeowner, including banding and the use of systemics. When a decision is made to spray highly valued landscape trees, biological agents such as *Bacillus thuringiensis* should be preferred. The gypsy moth, while a serious nuisance, need not be feared by the homeowner if managed wisely.

Gypsy Moth and the Forest

For the forest landowner, gypsy moth is a factor which should be incorporated into the ongoing management regime. Gypsy moth populations rise and fall in cycles, and some stressed trees can be expected to die. In areas where significant mortality is likely, pre-salvaging should be a management option. Chemical control is usually not an economically sound alternative, although the value a landowner places on a particular tree or forest may justify such an investment. The spraying of high risk acres can also be justified in situations where markets are temporarily unable to

support potential timber sales. In States where the gypsy moth has been established, however, annual timber losses following several ten year outbreak cycles tend to be significantly less than the cost of chemical control.

There are a number of biological reasons which make it undesirable to attempt large scale chemical control of gypsy moth. Spraying can upset natural control balances which come into play during periods of high population density. Natural predators and parasites of the gypsy moth may be negatively affected by applications of chemical pesticides. Use of pesticides to control populations toward the end of a defoliation cycle is risky, because chemical insecticides rarely kill all the insects. This may have the effect of sustaining populations which might have otherwise collapsed due to natural causes. Likewise, the purpose of spraying is to minimize current damage; it does not provide long-term population control in areas where the moth is an established pest.

Looking to the Future

Many questions about the gypsy moth remain unanswered. More research is needed to enhance population assessment, improve population forecasting techniques, improve risk and prediction models, and refine stand impact and defoliation assessment technology.

Rather than encouraging citizen anxiety about the gypsy moth, public understanding should be improved. Most important is a flexible and timely education program hinging on a comprehensive Statewide research effort. An informed public will best be prepared to deal with the gypsy moth in an effective, rational manner.

Editors note: The above article first appeared in "Gypsy Moth in Michigan 1986. The First Annual Report of the Gypsy Moth Technical Committee". Michigan Co-op Forest Pest Management Program Annual Report No. 87-2. Contact Dr. Bruce Montgomery, Department of Entomology Michigan State University, East Lansing, MI 48824.

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RHODE ISLAND'S EGG VIABILITY SURVEY PAYS OFF!

The Rhode Island Division of Forest Environment (DFE) cancelled its 1987 gypsy moth suppression project after testing egg viability. The method indicated that surviving gypsy moth population levels were too low to cause heavy defoliation in 1987. Without spraying, only 275 acres were heavily defoliated compared to 30,000 acres proposed for treatment based on egg mass surveys. The egg viability testing saved time, money and environmental contamination without resulting in significant defoliation. Here's how it happened.

In 1986, 144,820 acres had gypsy moth population levels greater than 750 egg masses per acre in Rhode Island's statewide survey. As a result, the DFE prepared to carry out a suppression project on up to 30,000 acres. However, the DFE was concerned about potential 1987 defoliation because many areas with lots of egg masses were heavily defoliated in 1986.

The DFE tested egg viability using a technique developed by George Saufley (USDA Forest Service). This technique

breaks up egg masses, dechairs them, separates viable and hollow eggs and counts them volumetrically. Advantages are inexpensive equipment and little training required and quick processing of egg masses.

The DFE collected 5 egg masses from each of 5 different locations in every town considering spraying. If the variability in viable eggs/mass was low, then this sample size was sufficient. If variability was high, then more egg masses were collected. In general, egg masses averaged about 50 percent of the eggs viable.

Once DFE knew how many larvae/acre would hatch, a compilation and analysis of the literature by Jim O'Brien (USDA Forest Service) was used to predict defoliation. This work indicated that 50 percent or less of the hatched larvae would survive to the fourth instar. Furthermore, each larva consumes about 4 oak leaves in its life and an oak forest averages 2.5 million or more oak leaves/acre. Using these estimates, DFE predicted that few areas would sustain 60 percent defoliation (the threshold to keep defoliation below).

Rhode Island's 1987 experience has implications to all States with gypsy moth:

- 1) Although viability testing costs time and money, the investment was small compared to the time and money saved.

- 2) How many other acres are treated every year that really don't need it? Here's a tool to help minimize those acres.

- 3) Using # of viable eggs/acre (or # of larvae/acre) predicts defoliation better than # of egg masses/acre.

Predicting defoliation and treating only areas needing protection requires more attention and refinement. Rhode

Island's DFE deserves credit for their action and leadership.

For more information contact Dennis Souto, USDA Forest Service, Forest Pest Management, PO Box 640, Durham, NH 03842.

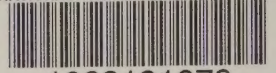
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MEETINGS

Annual Gypsy Moth Review, December 8-10, at the Charleston Marriott Town Center, Charleston, WV. For more information, contact Alan Miller (304) 348-2212.

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